

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 1858-SPL	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US03/22606	International filing date ( <i>day/month/year</i> ) 18 July 2003 (18.07.2003)	(Earliest) Priority Date ( <i>day/month/year</i> ) 18 July 2002 (18.07.2002)
Applicant THE JOHNS HOPKINS UNIVERSITY		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the Report**

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☒ Unity of invention is lacking (See Box II).

4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

Please See Continuation Sheet

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 2

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☐ None of the figures

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/22606

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
Please See Continuation Sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐  
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/22606

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01N 17/04, 17/02  
US CL : 73/86; 204/404; 205/776.5

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 73/86; 204/404; 205/776.5; 422/53; 436/6; 324/71.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 4,863,572 A (JASINSKI) 05 September 1989 (05.09.1989), abstract; Figures 1, 48; column 10, lines 1-31.	1,4-11,13,14,16,17 ----- 2,3,12,15,18-22
Y,P	WO 03/006958 A1 (SRINIVASAN) 23 January 2003 (23.01.2003), abstract; Figures 1-2C; paragraph 22.	1,4-11,13,14,16,17
Y	WO 02/46701 A2 (SRINIVASAN) 13 June 2002 (13.06.2002), abstract; Figures 4a-5; page 12, paragraph 49.	1,4-11,13,14,16,17
Y	US 3,788,962 A (FRENCK) 29 January 1974 (29.01.1974) abstract; Figures 1, 3; column 2, line 70 - column 3, line 39.	1

☐

Further documents are listed in the continuation of Box C.

☐

See patent family annex.

## \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;"

document member of the same patent family

Date of the actual completion of the international search

28 November 2003 (28.11.2003)

Date of mailing of the international search report

14 JAN 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Thomas P. Noland

Telephone No. (703) 305-4765

**Continuation of Item 4 of the first sheet:**

The title is insufficiently short under PCT Rule 4.3 since it includes information that could be assumed.

The new title: EMBEDDABLE CORROSION RATE METERS FOR REMOTELY MONITORING STRUCTURES

**BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING**

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1, drawn to an embeddable corrosion rate meter (ECRM).

Group II, claims 2-3 and 18-22, drawn to an ECRM system for detecting and measuring corrosion in metal structures or a method for detecting and measuring corrosion in a structure susceptible to corrosion.

Group III, claims 4-17, drawn to an embeddable system for detecting and measuring corrosion a structure susceptible to corrosion.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group I lacks unity with Groups II-III because they do not require the ECRM to be encapsulated in an aggregate-size, inert container, not bigger than about 2 cm in diameter and about 1 cm in height as in Group I and because Group I does not require the voltmeter to have an input impedance greater than a billion ohms as in Group II or to be used in a system of a plurality of ECRMs as in Group III. Group II lacks unity with Group III because it does not require the voltmeter to have an input impedance greater than a billion ohms as in Group II as evidenced by such only being claimed in dependent claim 12 of Group III and because Group II does not require use in a system of a plurality of ECRMs as required in Group III.

**Continuation of B. FIELDS SEARCHED Item 3:**

IBM\_TDB, US-PGPUB, EPO, JPO, DERWENT, USOCR, USPAT

search terms: ecrm, embeddable, embedded, embed, embedding, embedder, embeddor, corrosion, corroding, corroding, rate, meter, probe, sensor, sensing, sense, sensed, probed, probing, prober, detect, detected, detection, detecting, detector, measure, measured, measurement, measuring, measureing, measurer, program, programmable, programming, programmed, reader-head, reading-head, read-head, readerhead, readinghead, readhead, reading, reader, read, head

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/22606

## Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

## NEW ABSTRACT

An embeddable corrosion rate meter (ECRM) for detecting and measuring corrosion in metal and concrete structures comprises an electrochemical cell with an ECRM sensor circuit (20). Circuit (20) includes at least one working electrode (10) evenly spaced from counter/reference electrode (12) with the separation distance between the electrodes determining an electrolyte medium resistance. Circuit (20) also includes a current source generated by power source (28) connected through different resistances R1 (26) to Rn (24). A first selector is used in applying current through each or the plurality of resistances to working electrode (10) and a second selector (16) selects a duration of the current pulse. Current is applied between the electrodes through galvanostat (22) and polarization of working electrode (10) is measured by voltmeter/A-D converter (18) connected via link (34). The voltmeter has an input impedance greater than a billion ohms. An external reader-head with power link (32) powers circuit (20) and reads and transfers corrosion measurement data via data link (36) to computer (30).